

**Variable Site Effects Across the I-5 Highway 14 Interchange
that Failed During the Northridge Earthquake**

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Soon after the M= 6.6 Northridge earthquake, prompt observations were made to examine the site, inspect the collapsed interchange and place seismometers to record aftershocks. A principle objective was to determine the effect of local variability of ground motion beneath this large concrete structure, which extends over ~two kilometers. This is part of a comprehensive study of the failure of the interchange, which includes prediction of the strong motion from weak motion (aftershocks), numerical modeling of structural response to extrapolated strong motion, and laboratory measurements of the mechanical properties of samples from the site.

Laboratory measurements are aimed at 1) testing linear extrapolation of ground motion at this site and 2) checking for rock dependent site variability. A unique laboratory apparatus, capable of reproducing seismic frequencies and strains in shear (torsional geometry), is used to test surface and core samples from locations coincident with seismometer sites. Results indicate that local site differences can be significant, depending on the presence of swelling clays in friable sandstones. Shear moduli as determined at low frequencies, 1 to 10 Hz, are sensitive to water vapor adsorbed at grain contacts, leading to shear weakening. Quantitative measurements of the nonlinear response are now underway to determine if nonlinear effects were significant during the strong motion. With these data, it should be possible to begin separating the relative contributions of topographic effects, deeper stratigraphy, and near surface rock properties to the larger than expected seismic effects at the interchange.

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4. IASPEI

5. S5 Ground Motion
Analysis from
Recent Strong
-Motion Data

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